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<p>(21) International Application Number: <b>PCT/SE93/00321</b>  (22) International Filing Date: <b>14 April 1993 (14.04.93)</b>  (30) Priority data:  <b>9201213-7</b> <b>16 April 1992 (16.04.92)</b> <b>SE</b>  (71) Applicant (for all designated States except US): <b>AB ÄKER-LUND &amp; RAUSING [SE/SE]; Box 22, S-221 00 Lund (SE).</b>  (72) Inventor; and  (75) Inventor/Applicant (for US only) : <b>NILSSON, Bertil [SE/SE]; Ljunitsvägen 8, S-232 54 Åkarp (SE).</b>  (74) Agents: <b>GRAUDUMS, Valdis et al.; Albihn West AB, Box 142, S-401 22 Göteborg (SE).</b></p>		<p>(81) Designated States: <b>AT, AU, BB, BG, BR, CA, CH, CZ, DE, DK, ES, FI, GB, HU, JP, KP, KR, LK, LU, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SK, UA, US, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</b></p> <p><b>Published</b>  <i>With international search report.</i></p>
<p>(54) Title: <b>A CONTAINER LID AND ITS METHOD OF PRODUCTION</b></p>		
<div data-bbox="435 1203 1235 1402"> </div>		
<p>(57) Abstract</p> <p>A container lid (1) consisting of two material layers (2, 3) manufactured without the use of any adhesives of any type (e.g. hot-melt adhesive) between the first and second layers wherein the second layer (3) is normally a label. The layers are held together purely by the effect of heat which is applied to one of the layers during thermoforming thereof, this heat being subsequently transferred to the other layer surface by contact, such that a bond between the two layers is formed.</p>		

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A container lid and its method of productionField of the invention

The application concerns a lid for a container, said lid being formed from a first material layer and a second material layer, said first material layer being thermoformed and said first and second material layers being attached to each other.

Background art

Container lids of the above mentioned type are known in the prior art and have found widespread application in the area of dairy products such as butter, margarine and cheesespreads for example. Such lids are normally constituted by two material layers, one of said layers having been heated and then shaped or formed (thus thermoformed) into its final shape which normally includes a reclosable flange, and the other layer being a second, flat and printed layer (label layer) of cardboard or of a flexible sticky-back type. Where cardboard is used, either a glue application or mechanical attachment means are required such as projections formed on the first layer flange which overlap the edges of the cardboard layer and hence attach one layer to the other. Where a sticky-back label is used, the label normally has pressure-sensitive adhesive and is applied using minimal pressure to the thermoformed first layer.

Such lids of the prior art are however not readily suitable for recycling without additional handling. In the case of a cardboard second layer for example, special means are required for separating the cardboard from the thermoformed first layer when the containers are returned and in the

case of the glued label, special means are required to remove the stuck label from the first layer.

5 In order to provide a container lid which is readily recyclable, it is known to thermoform a lid of only a single material layer and then subsequently to print directly on to said layer. However, since the printing operation must take place after the lid has been thermoformed (to avoid that the printed matter becomes distorted or ruined due to thermoforming temperatures) a  
10 problem arises in that standard offset printing is no longer possible since standard offset high-speed printing techniques in this industry normally print on to a large flat sheet, whereas the small thermoformed lid has a raised flange for attachment to the container. Consequently it  
15 requires special design of the offset equipment to adapt it to the limited space available for the printing elements which have to be introduced into the flat area of the lid surrounded by the raised flange.

20 In another technical field, that of container cases and trays, as opposed to container lids, one is faced with the additional problem of layers for strength and layers for decoration being held together by the use of hot-melt adhesives, which are also not easily separable for recycling purposes. In order to overcome these problems it  
25 has been proposed in our Swedish application number 9200358-1, filed on 7th February 1992, that the tray portion of a formstable container be given the required characteristics by forming the inner and outer material layers of thermoformable material wherein the inner layer  
30 is given the structural characteristics required and then the outer decorative layer is attached to this without the use of any hot-melt or other adhesive means. In this way it is possible to use the same material for the inner and the outer layers and to bind them together by the use of heat

without any additional intermediate material, thus providing a readily recyclable container.

In this application, the principles underlying container tray formation have been adapted to the problems underlying lid manufacture.

Although related only to container trays or cases, a method is known from EP-A-0 395 585 for producing a two layer container with a truncated outer label layer. However this method of production requires the use of a heat shrinkable film for the outer layer which has to be applied in a first step to a pre-former die whilst in a heated state and then subsequently inserted into a female mould.

A further prior art document EP-A-0 249 363 discloses, in one embodiment, a method whereby a label and lid may be combined without intermediate material. However this process relates to injection moulding which consequently involves molten material entering the mould cavity. The temperature of the molten material is detrimental to the label layer and thus special measures must be adopted in the form of protective patches applied to the label at the points where plastics material enters the mould. This protective application results in extra process steps of patch fitment with consequent increase in material and time costs.

#### Summary of the invention

The above-mentioned and other deficiencies presented by prior art methods and containers are solved in accordance with the present invention which provides a lid for a container having the features defined in claim 1 and a method for producing a container lid having the features defined in claim 8.

Preferred features of the invention are defined in the dependent claims.

5 The solution provided by the present invention allows conventional thermforming equipment and conventional offset printing equipment to be employed and avoids the necessity for any adhesive, binding substance or any mechanically-formed connections between the layers. This is achieved by utilisation of the heat stored in the first material layer when it is heated in order to soften it for thermoforming  
10 it into the closing lid final shape. Prior to forming the heated first layer in the mould, the second layer, already having been printed, is placed with its printed surface lying on the cool female section of the mould of the forming apparatus and its non-printed surface facing the  
15 heated first layer above it. During formation of the heated first layer, the first layer is pressed against the second layer and the heat of the first layer produces a fused connection at the interface of the first layer and the second layer. Since the flat, cooled female section of the  
20 mould faces the second layer printed surface, the printing remains intact and undistorted.

By this process the same material can thus be used for both the first and the second layers of the lid and, since no binding solution or other binding layer is used between the  
25 layers, a perfectly recyclable container consisting of one material only is provided. When recycling, the lid merely needs to be ground down to provide a new source of material for renewed lid/container production.

30 Various thermoformable materials already find wide application in current lid manufacturing technology such as PVC, polyethylene, polypropylene or plastic laminates, to name but a few. The lid and method of this invention are clearly not limited to one type of material and any

suitable thermoformable material can be used for the first layer as long as it can be bonded to the second material layer merely by the use of heat without binding material of any sort between the surfaces of the layers. However, to provide optimum recyclability, the most usual form of the container lid would be where both the materials of the first and second layer are non-laminates. This is even more advantageous where the container case section is also formed of the same material, such that separate recycling processes for the container and lids do not need to be used. Additionally and importantly, the full advantages of standard printing facilities for flat sheet are maintained.

The invention will now be elucidated by reference to the drawings which show a preferred embodiment, said embodiment being merely an example of the invention which should not be considered as limiting in any way for the scope of the invention, many other embodiments being imaginable within the scope of the appended claims.

#### Brief Description of Figures

Fig.1 shows a finished container lid with a closing flange.

Fig.2 shows a section through the lid taken along line I-I of figure 1.

Fig.3 shows a sectional view through the lid, along line I-I of figure 1, during thermoforming of the lid in the thermoforming mould.

#### Description of a preferred embodiment

Figure 1 shows a container lid of the present invention generally denoted by the reference numeral 1. The container lid consists of two material layers, the first material

layer 2 being a thermoformable foil of any suitable material such as PVC, polypropylene or polyethylene for example. The second material layer or label layer 3 of the lid is bonded to the upper surface of the first material layer 2 without the use of any adhesive, hot-melt compound or other additional material. The second material or label layer generally has printing thereon to enable the product to be distinguished. This printing can be of any desired form, such as for example a bar code, general product information, a picture of whatever type or any combination of these.

The second material layer 3 consists of a thermoplastics material of any suitable type. The layers 2 and 3 are normally bonded together in the flat or substantially flat region of the first layer which is bounded by the upstanding rib 4 of the closing flange (generally denoted as A in Figure 1). The raised rib 4 is designed to allow a reclosable connection onto a corresponding section of the container top edge and hence some flexibility is provided in its structure to allow it to elastically deform over the corresponding container top edge. Some reinforcement of the inner part of the lid (normally at the corners) next to the rib can be provided if such is desired.

Portion 5 of the lid designates a generally flat section of the lid flange formed around the outside of the raised rib 4, which section can seat upon a corresponding section of the container top-edge. Section 5 is continued in a further vertical or slanted section 5' and finishes in a laterally projecting lip section 6 which can, if desired, be formed with a grip-tab 7 for easier opening. Whilst several portions 4, 5, 5', 6 and 7 have been indicated and described, it is clear that the flange section A could be constructed differently without departing from the scope of the invention.



Figure 2 shows the container lid in cross section, the label layer 3 being bonded to the lid layer 2 in the central portion, which is generally flat. A slight gap is depicted between the edge of the label layer 3 and the rib 4 although if desired no gap need exist. The thickness of the second material or label layer 3 is of no particular importance but it is normally kept as thin as possible to avoid material waste. As such, the thickness would normally be of the order of 20 $\mu$ m but can be as little as 10 $\mu$ m or as high as 80 $\mu$ m or even more if required, whereas the thickness of the first layer is generally greater since this is used to give form-stability to the lid section. An order of thickness in the region of 160 $\mu$ m up to 300 $\mu$ m is normal, but clearly other higher or lower values can be used as long as sufficient stability is maintained.

As can be seen, the second or label layer 3 is attached to the flat area of the first material layer 2. The label layer is generally printed using a standard offset printer to print a large sheet or web of labels. The labels are then cut and punched out of the printed sheets to the required label size.

The manner of forming the lid from the two separate material layers 2 and 3 will now be described with reference particularly to figure 3. A forming tool is used which has a female part consisting of mould elements 11 and 12 separated along the line 13. The second material layer 3 being precut is positioned, as shown, on the mould part 11. A vacuum is applied to the drillings 10 in the mould piece 11 such that the precut material layer 3 is held in this position. The foil which constitutes the first material layer 2 is in the form of a continuous web and is roller driven towards the mould and then heated by a source of heat (not shown) positioned generally just outside of the mould. Depending on the type of mould employed, the

first material layer 2 is either vacuum formed entirely, or a male member (not shown) of the moulding machine presses the foil (first material layer) into the shape of the female sections 11 and 12 depicted. With either method the application of force to the foil 2, also applies a force down onto the second material layer 3 lying with its printed surface against the mould, the heat and pressure from the first layer 2 being such as to cause the first layer to become molecularly bonded to the second layer 3, without that any material need be placed between the layers (such as hot-melt for example). The mould is of course cooled such that the heated and formed lid will not adhere to the mould, which obviously allows the added advantage that the printed surface of the second layer can directly contact the mould without resultant damage to the printed matter.

When this cycle is complete, the mould is opened along line 13 by a vertical movement of part 12 relative to part 11, the lid ejected, punched and then conveyed for stacking.

With the known "traditional" process the lids consist of one layer which is first vacuum-formed and then printed. Since the printer operates at much faster speeds than the thermoforming machinery, several thermoform machines work in parallel to supply a single print machine in order that the economy of rapid production is preserved. However, stacking of the thermoformed lids with flanges is required in order to feed the machine adequately. The required buffer zone of stacked lids, the problems of synchronisation and the reliability of stacking and de-stacking of lids with flanges is considerable, but one which industry has thought unavoidable if a fully recyclable lid with printing is to be produced. However, by the method of the present invention all these problems are avoided, since the flat, precut, preprinted and dried label

layers 3 are merely placed in a conventional dispensing apparatus for flat articles and then transferred into the mould cavity, the dispensing and transfer apparatus being conventional equipment.

## Claims

1. A lid (1) for a container, said lid being formed from  
5 a first material layer (2) and a second material layer (3),  
said first material layer being thermoformed and said first  
and second material layers (2,3) being attached to  
eachother, characterized in that the material of said  
10 second material layer (3) is the same as the material of  
the first material layer (2), and in that said first and  
second material layers are directly attached to eachother  
by bonding of their contacting surfaces together by the  
effect of heat, without any intermediate material.
- 15 2. A lid according to claim 1, characterized in that said  
first material layer (2) is thicker than said second  
material layer.
- 20 3. A lid according to either of claims 1 or 2,  
characterized in that the lid has a closing flange (A),  
said closing flange being formed on said first material  
layer, said second material layer having a smaller surface  
area than said first material layer and being applied to  
the first material layer inside the area bounded by the  
flange.
- 25 4. A lid according to claim 3, characterized in that said  
closing flange is of the type which allows reclosure after  
opening.
- 30 5. A lid according to any one of claims 1 to 4,  
characterized in that said second material layer is a label  
layer having either printing or decoration thereon.

6. A lid according to any of claims 1 to 5, characterized in that the thickness of said first layer (2) lies in the range of 160 $\mu$ m to 300 $\mu$ m whereas the thickness of the second layer (3) lies in the range of 10 $\mu$ m to 80 $\mu$ m.

5 7. A lid according to any of claims 1 to 6, characterized in that said label layer is attached to said first layer over an area which is relatively flat.

10 8. A method of producing a lid for a container, wherein the lid consists of two material layers (2,3) of the same material, the first material layer (2) being softened by the action of heat and then being thermoformed to the second material layer (3), whereby the heat in said first layer is sufficient to securely bond said first material layer to said second material layer without the presence of  
15 any intermediate material.

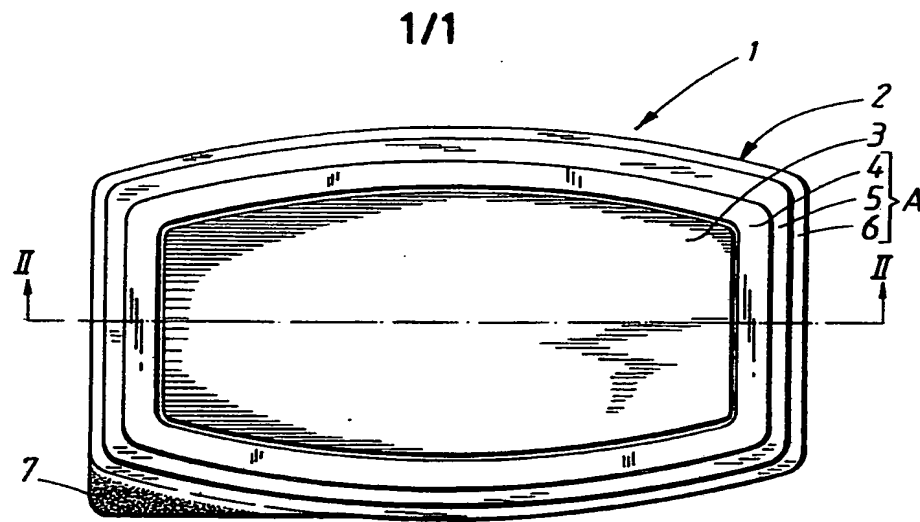


FIG. 1

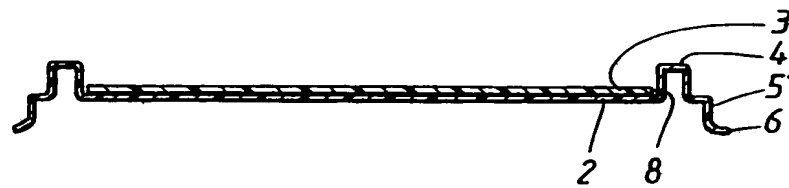


FIG. 2

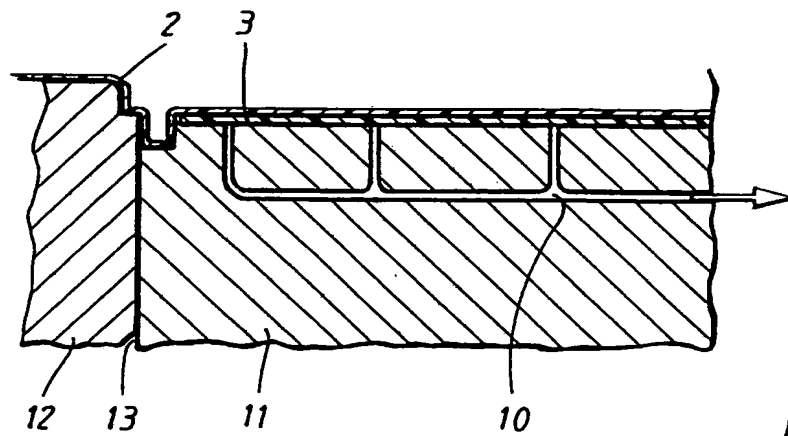


FIG. 3

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 93/00321

## A. CLASSIFICATION OF SUBJECT MATTER

IPC5: B29C 51/16, B65D 43/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC5: B29C, B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP, A2, 0249363 (PEERLESS PLASTICS PACKAGING LIMITED), 16 December 1987 (16.12.87), column 6, line 35 - line 38; column 7, line 11 - line 13 --	1,8
A	EP, A2, 0395585 (FUJI SEAL INDUSTRY CO. LTD.), 31 October 1990 (31.10.90), column 7, line 26 - line 33 --	1,8
A	EP, A1, 0467002 (FUJI SEAL INDUSTRY CO. LTD), 22 January 1992 (22.01.92), column 4, line 35 - line 37 --	1,8

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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## INTERNATIONAL SEARCH REPORT

International application No.

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## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP, A2, 0422542 (MANVILLE CORPORATION), 17 April 1991 (17.04.91), column 7, line 50 - line 56	1,8



**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

02/07/93

International application No.

PCT/SE 93/00321

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EP-A2- 0249363	16/12/87	SE-T3- 0249363 AU-B- 597667 AU-A- 7369887 CA-A- 1274367 GB-A,B- 2191729 JP-A- 63025012 US-A- 4795597	07/06/90 17/12/87 25/09/90 23/12/87 02/02/88 03/01/89
EP-A2- 0395585	31/10/90	JP-A- 3073332	28/03/91
EP-A1- 0467002	22/01/92	US-A- 5043130	27/08/91
EP-A2- 0422542	17/04/91	CA-A- 2027166 JP-A- 3226432 US-A- 5098498	11/04/91 07/10/91 24/03/92